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# RECENT APPROACHES TO CANADA GOOSE MANAGEMENT



**SPECIAL SCIENTIFIC REPORT: WILDLIFE No. 66**

**UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE**

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UNITED STATES DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service  
Bureau of Sport Fisheries and Wildlife

RECENT APPROACHES TO CANADA GOOSE MANAGEMENT

by

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## INTRODUCTION

During the past 15 years considerable attention has been focused on research and management problems associated with the Mississippi Valley population of Canada geese. As indicated by Hanson and Smith (1950), the general breeding, migration, and wintering ranges are well defined. Because this flock is closely associated with national wildlife refuges and State management areas in Wisconsin, Michigan, Ohio, Indiana, and Illinois, and the majority of this population winters in southern Illinois and vicinity, it has been possible to determine quite accurately annual total population trends, annual harvest rates, and the breeding potential of the population sent back to the breeding grounds each spring (Smith and Davis, 1958). Based on knowledge accumulated for this population, steps are being taken to compile similar information for other major continental Canada goose populations.

In certain parts of the country, particularly in the vicinity of the major Canada goose concentration areas, equal attention has been focused on new management measures being employed to properly control the harvest, to improve distribution of the kill, and to improve the quality of hunting. Those directly involved in Canada goose management programs feel that substantial progress has been made during the past 5 years in this respect by State and Federal agencies concerned.

I wish to acknowledge information and suggestions obtained through personal discussions and correspondence with Harold C. Hanson, Illinois Natural History Survey; Allan Studholme, Arthur S. Hawkins, Raymond Buller, R. C. Hanson, and Walter Crissey, Bureau of Sport Fisheries and Wildlife; Richard Hunt, Wisconsin Conservation Department; George Arthur, Illinois Conservation Department; and C. E. Shanks, Missouri Conservation Commission. Many other Bureau and State personnel at the refuges and management areas concerned and members of the technical sections of the Mississippi and Central Flyway Councils provided additional information. Cecil S. Williams, Director of the Denver Wildlife Research Center, generously provided a copy of his unpublished manuscript on Canada geese for review.

## CLASSIFICATION AND RANGE

A brief discussion of the classification and ranges of the Canada geese concerned in management programs in the Mississippi and Central Flyways is presented, based on the works of Aldrich (1946, 1957), Todd (1938), Hanson (1951), Hanson and Smith (1950), Hanson and Griffith (1952), and Delacour (1954), to clarify the subspecies or races with which we are dealing. These involve the Great Basin goose (Branta canadensis moffitti) which is associated with western portions of the Central Flyway and ranges eastward to the Missouri River; the Interior or Todd's goose of the Mississippi Flyway (B. c. interior), and the smaller forms commonly referred to as Richardson's or Hutchin's goose (B. c. hutchinsi) and the lesser Canada goose (B. c. parvipes), referred to here generally as "small" Canada geese, which migrate in sizable numbers through the eastern Dakotas, western Minnesota, and south through Nebraska, Kansas, Oklahoma, and Texas.

The broad ranges of the major populations of Canada geese are shown in figures 1 and 3. For the sake of standardizing terminology, "population" is used to designate all components of a given group utilizing fairly well defined breeding grounds, migration routes, and wintering grounds. Each population may be made up of several "flocks" associated with specific concentrations north of the primary wintering grounds.

In reviewing figure 1, it should be pointed out that the Atlantic population in reality should perhaps be broken down into two or more major components, such as north Atlantic and south Atlantic, as suggested by Hanson and Smith (1950) and Williams. This population is made up largely of two races of the common Canada goose, B. c. canadensis and B. c. interior.

The Southeastern population intermingles to some degree with the Mississippi Valley population, but the major segments do continue in an easterly and southerly direction to the interior areas of Tennessee, North Carolina, South Carolina, and Florida. Band recovery data from birds banded at the Jack Miner Sanctuary in Ontario and additional limited banding in eastern Michigan indicate that the breeding ground of these birds is in the southern James Bay region. This group consists probably entirely of the Interior Canada goose, B. c. interior.

The Mississippi Valley population, B. c. interior, is perhaps better defined than any other group of geese, largely because of the extensive work done by Dr. Hanson, personnel from the Illinois Conservation Department, and other Federal and State personnel cooperating in management and census programs. It has been well established that the breeding range for this population extends from the western James Bay

area, along the Hudson Bay lowlands, and north to the Cape Tatnam area (Hanson and Smith, 1950). Others may come from the east side of Hudson Bay. The migration area extends west to the Mississippi River and east to central Michigan and northwestern Ohio, with the majority of the birds funneling into southern Illinois and vicinity where most of them now winter. Band recoveries indicate that only a small segment of this population continues to migrate south along the Mississippi River to the Gulf Coast. Populations are building up, however, at the Kentucky Woodlands, Tennessee, Wheeler, and Noxubee National Wildlife Refuges. Additional Federal refuges and State management areas are being developed to attract geese southward below Illinois to improve distribution of existing populations and permit continued expansion of individual flocks in the southern part of the flyway in conformance with the Mississippi Flyway Waterfowl Management Plan. There are indications that these flocks have developed independent of other flocks to the north and should perhaps be considered as a separate population.

The Eastern Prairie population occupies a rather broad range adjacent to the Mississippi Valley population, with the breeding range merging with the Mississippi Valley population in the Cape Tatnam area of the Hudson Bay lowlands, extending along the west coast of Hudson Bay to just north of Churchill. There are additional indications that a small segment of this population breeds farther inland in the interlake region. The western limits of this population extend to about the Saskatchewan-Manitoba border, through the Dakotas in an area lying east of the Missouri River, with a slight eastward shift in the migration route to eastern Nebraska, into Missouri, and south through eastern Kansas, Oklahoma, and Texas. As the volume of band recovery data increases, there is further evidence of only a slight overlap between the Eastern Prairie population and the Mississippi Valley population which winters in southern Illinois. A larger segment of this population does, however, move south through Missouri, Arkansas, and western Louisiana into Texas. This group appears to be made up largely of B. c. interior.

In order to make the picture of the ranges of Canada goose populations in the central United States more complete, an additional group should be added. These birds represent a population breeding in central Canada, migrating through Saskatchewan, western Manitoba, eastern Montana and Wyoming, western Dakotas, Nebraska, and on southward to central and east Texas. A large number of this population is represented by geese using the Missouri River in South Dakota--a portion of them wintering there. A segment of this population frequently intermingles with a portion of the Eastern Prairie population at the Swan Lake Refuge in Missouri. It has been suggested by Williams that this group should be designated as the Western Prairie population. It is assumed that most of these large geese are B. c. moffitti.

Within the designated ranges of the major populations of large Canada geese, there is a rather well defined migration route of "small" Canada geese which breed in several known localities in the central and eastern Arctic. On the basis of an extensive banding program at the Sand Lake National Wildlife Refuge, South Dakota, during the past 10 years, and breeding ground investigations conducted by Canadian Wildlife Service personnel, the range of this group is becoming better defined as shown in figure 3 (MacInnes, 1960, and personal correspondence).

## POPULATION TRENDS

Population trends for the four major populations of Canada geese in the Central and Mississippi Flyways are shown in tables 1 through 4. Much still remains to be learned about the "small" Canada geese associated with Sand Lake Refuge and the larger forms associated with the Missouri River in South Dakota. New management techniques are being developed for these populations. The first attempt to carry out a coordinated census of this group of "small" Canada geese throughout the Central Flyway was conducted October 23-24, 1961. These data indicate the total population size during the fall of 1961 was in the neighborhood of 100,000 to 125,000 geese. Data pertaining to the Mississippi Valley population are the most complete and are used throughout the remainder of the discussion to illustrate specific points.

## MANAGEMENT PROCEDURES

Control of distribution and harvest of Canada geese in the United States are achieved largely through a system of State and Federal management areas or refuges, privately owned sanctuaries such as Miner's in Ontario, and Federal and State regulations. As concentrations of geese increased on the major refuges involved and increased hunting pressure developed, many specific management techniques and area regulations have been initiated to control the annual harvest, to achieve better distribution of kill, and to improve the quality of goose hunting.

As in the case of other species of migratory waterfowl, Federal regulations establish the broad framework for season length, bag and possession limits, and shooting hours within the respective flyways. Some specific Federal regulations have been directed toward protection of geese in the Mississippi Flyway on an area basis when the resource appeared to be in jeopardy. The majority of all other special area regulations have been initiated by the States concerned. Some of the measures employed during the past 15 years in the management of the Mississippi Valley population of Canada geese to control harvest, improve distribution of hunting opportunity, and improve the

quality of hunting, include a closed season on Canada geese throughout the Mississippi Flyway in 1946, special closed zones, licensing of hunting clubs, mandatory reporting of kill by clubs, spacing of blinds, hunting of geese from pits and blinds only, establishment of special delayed opening zones and shooting hours, reduction in daily bag and possession limits in the vicinity of concentration areas, establishment of managed public hunting areas, and initiation of a harvest quota system. These individual practices will be discussed in further detail with special emphasis on procedures followed in setting up the harvest quota system.

Closed Season and Zones: Following the decline in the Mississippi Flyway Canada goose population in 1943-45, the entire flyway was closed to hunting of this species in 1946 under Federal regulation.

Because the majority of the Mississippi Flyway Canada goose population was associated with the Horseshoe Lake Refuge in southern Illinois and the high kill which occurred in the vicinity of the refuge, a 20,000-acre area surrounding the refuge was closed to hunting in 1947 by proclamation by the President of the United States and the Governor of Illinois. This zone remained in effect until 1953, when it was reduced to 9,000 acres, and it was eliminated in 1954 when it was apparent the goose population was showing a steady annual increase (Davis, 1954). During this interval, the Illinois Department of Conservation enlarged the Horseshoe Lake Refuge and established the Union County Refuge, and the Fish and Wildlife Service established the Crab Orchard National Wildlife Refuge, to aid in dispersal of the geese in southern Illinois. Intensive agricultural programs were also activated on the three areas concerned to provide adequate fall and winter food supplies. Special regulations on length of season and closure provisions now apply to a 4-county area in southern Illinois which surrounds the above three areas as shown in figure 5.

In Wisconsin the radius of influence has been determined for the goose flocks using the Horicon and Necedah National Wildlife Refuges. Area closure regulations were established in 1960 based on the 2-county area, Dodge and Fond du Lac, surrounding the Horicon Refuge, and portions of three counties surrounding the Necedah Refuge. State and Federal regulations pertaining to goose harvest are presently based on this delineation as shown in figure 4.

In Missouri the radius of influence has been determined for the Canada goose flock using the Swan Lake National Wildlife Refuge and adjacent State management areas, and special closure regulations pertaining to portions of a 4-county area surrounding Swan Lake have been effected by the State when the kill reaches designated proportions.

Licensed Hunting Clubs: In 1941 the Illinois Department of Conservation initiated its club permit system which required registration of hunters and kill. Section 57 of the Illinois Game and Fish Code sets forth the requirements for licensing and compulsory reporting for lands operated as commercial wild goose hunting areas. This regulation has undergone minor changes, but remains in effect today (Game Code of Illinois--1959). This was one of the early milestones for controlling hunter activity and provides an effective method for determination of harvest as the season progresses.

No other State in those portions of the Central and Mississippi Flyways with which we are concerned presently has a club license regulation, but this procedure is being given serious consideration in those States where early closures have been effected and where more accurate kill data are required.

Blind Spacing and Confinement: Section 31 of the Illinois Game and Fish Code sets forth methods by which migratory game birds may be taken on property operated under a wild goose hunting area permit on other than licensed hunting areas. Specific regulations govern pit and blind spacing. It is unlawful for any person to establish or use more than one blind or pit for each 20 acres or major fraction thereof; for any person to establish or use any blind or pit for the taking of wild geese within 200 yards of any other blind or pit or within 100 yards of the property boundary; and for any person to establish or use any blind or pit for the taking of wild geese within 200 yards of any refuge boundary or public road right-of-way adjacent to any State or Federal waterfowl refuge.

Section 31 of the Illinois Game and Fish Code states that it is unlawful for any person to take wild geese, except from a blind or pit, on any area operated under a wild goose hunting area permit or other than licensed areas, and makes it unlawful for more than two persons, but not including any employee of a licensed hunting area, to occupy any blind or pit at the same time. All guides are required to register with the Department so the proper credentials can be issued.

In 1960 the Wisconsin Conservation Department established a number of area regulations pertaining to goose hunting in the vicinity of the Horicon National Wildlife Refuge, such as prohibition of shooting from roadside and railroad rights-of-way in the 2 p.m. closing zone and the requirement that all blinds be at least 75 yards from the refuge boundary. In 1961, additional restrictions were adopted which required that goose hunting within the 2 p.m. closing zone be confined to pits or blinds, and that such blinds be 200 yards apart and at least 100 yards from property lines, with not more than three hunters per blind permitted (Wisconsin Administrative Code, amended--1958). While there were some fears initially that these restrictions would meet considerable public opposition, it is encouraging to note

that there have been many favorable comments received since the close of the 1961 hunting season in Wisconsin. Most hunters recognize that pit or blind hunting and blind spacing requirements have greatly improved the quality of hunting and enabled cleaner kills with less crippling when there is room to allow birds to work over decoys.

Establishment of Delayed Opening Zones and Special Shooting Hours: A number of States have experimented with the effects of establishment of delayed opening dates, earlier closing hours, half-day shooting, etc. In Alexander, Union, Jackson, and Williamson Counties in Illinois, wild geese may be taken only between sunrise and 3 p.m., central standard time, during the open season. In Wisconsin, goose hunting has been stopped at 2 p.m. within the managed hunting area on the refuge and delineated zone surrounding the refuge. A similar approach was tried at the Necedah Refuge. When first initiated, these delayed openings and early closing zones were designed to permit birds to develop and maintain a daily feeding pattern outside the refuge, thereby increasing the opportunity to kill geese. The primary objective has been accomplished in most cases, and this feature may now be enhancing a more rapid kill rate in the vicinity of some areas. This procedure should be reviewed critically in the future.

Considerable thought has been given to the value of delayed season openings, and the merits of this procedure must generally be weighed on the basis of local problems. For example, in the vicinity of the Horicon Refuge in Wisconsin, goose hunting was generally delayed a week or more beyond the earliest permissible opening date in order to permit geese to develop established feeding patterns considerable distances away from the refuge so as to achieve better distribution of hunting opportunity. The results of this approach may have backfired to some degree at Horicon. In 1960 a population of nearly 70,000 geese was present at the time the season opened. Following the 9½-day hunting season more than 50,000 remained on the area well into December and a wintering population of more than 10,000 birds developed. Present thinking is that it would be better to keep the hunting pressure on during the early stages of migration in Wisconsin so as to attempt to force a portion of the population on south in an effort to discourage the wintering trend. This, of course, presents a problem with respect to carrying capacities of wintering areas in Illinois and points south.

There is a somewhat different situation with delayed opening provisions concerning the Eastern Prairie population at the Swan Lake Refuge in Missouri. In the past, early openings accompanied by a closure after three to four weeks of hunting have resulted in larger numbers remaining through the winter. In this area, winter temperatures do not usually become cold enough to force birds farther



south, so it is felt that if hunting could be continued later, through the month of November, such pressure may force additional birds south. This was tried in 1961; however, the Missouri Conservation Commission, through mutual agreement with the Bureau of Sport Fisheries and Wildlife, closed the season in the 4-county area surrounding Swan Lake on November 25 after 25 days of hunting when the kill reached 15,000 geese. A population of approximately 45,000 geese remained through the winter.

It is likewise beneficial to have a later opening at Swan Lake to enable Bureau and State personnel to carry out preseason banding operations in connection with population studies under way there. Again, these approaches are complicated by the amount of food present within the Swan Lake Refuge, status of harvest of agricultural crops on adjacent private lands in relation to depredation problems, and the ability of wintering areas farther south to adequately provide for birds that do move there.

Reduction in Daily Bag Limits: Even though Federal regulations have provided for a bag and possession limit of two Canada geese in the Mississippi Flyway during recent years, additional restrictions have been imposed by some States. In 1960 the Illinois Department of Conservation reduced the daily bag and possession limit to one Canada goose in the four counties concerned. It was hoped that this would reduce the daily kill rate, thereby prolonging the season. There is good evidence that this result was achieved, but it was apparent that this regulation had a rather severe impact on local economy associated with goose hunting. Many hunters apparently were reluctant to travel any distance when permitted only one Canada goose in the daily bag and possession limit. The general opinion of club operators and businessmen in southern Illinois was "give us a daily bag and possession limit of two geese and we will settle for a shorter season." This approach was tried during 1961 to compare results. The daily bag limit was again increased to two birds in 1961, but owing to a slow build-up in numbers of geese, the daily kill rate remained much lower than previous years so no direct comparison could be made with the 1960 season.

The Wisconsin Conservation Department established a daily bag and possession limit of one Canada goose in Dodge and Fond du Lac Counties during 1960 in an effort to reduce the daily kill rate and prolong the season. Again this feature resulted in greater distribution of hunting opportunity, but the agreed upon quota for the counties concerned was still taken in  $9\frac{1}{2}$  days of hunting. Wisconsin continued the one Canada goose bag and possession limit in 1961 and further modified area regulations for the managed shooting area within the Horicon National Wildlife Refuge to limit the daily kill to one goose of any species.



Season Bag Limits and Registration System: There has been considerable discussion during recent years regarding the practicality of establishing a season bag limit on Canada geese accompanied by some registration or tag system so as to make it enforceable. The strongest argument for such an approach is that many individuals now killing 25 to 50 geese annually in the vicinity of major concentration areas would be limited to the established season bag. In addition, the accompanying tag or registration feature would permit more accurate determination of the total number of Canada geese killed any given year. Opponents of this proposal believe that the season bag limit may not necessarily reduce the total kill but would result in the distribution of kill among more hunters. There are others who claim this would discriminate against the more exclusive clubs which are presently paying dearly for the sport of goose hunting. Considerable attention will undoubtedly be given to implementing a season bag limit and an accompanying registration feature in the vicinity of major goose concentration areas in this Region in future years.

An experimental season bag limit using tags was initiated in Wyoming during 1960 to maintain further control over the kill of a segment of the Great Basin Canada goose flock in that State and to discourage further leasing of prime goose hunting locations in the vicinity of major concentration areas throughout the State. They established a season bag limit of six birds, based on a statistical interpretation that this would result in a 35 percent reduction in kill, so as to maintain a season harvest nearly equal to that experienced in 1959. Ten thousand tags were printed at a cost of \$62. These tags were distributed to bona fide holders of bird hunting licenses and Federal duck stamps at no charge to the hunter. Regulations required that the tag holder sign his name and affix the tag to the goose as soon as the bird was killed. Of the 10,000 tags printed, 3,700 were issued throughout the State. Wrakestraw (1961) indicated that the Wyoming Game and Fish Commission was well satisfied with this initial attempt at spreading out the goose kill among more hunters, and they intend to carry on with the six-bird season limit and use of tags for at least another year in order to evaluate the effect on kill and distribution of hunting opportunity.

It is interesting to note some of the comments reported by Wrakestraw. Many hunters said "six geese should be enough for anyone." Others remarked that it was the best thing that ever happened. Several old-time goose hunters declared a six-bird limitation would not make any difference to them because they would take out relatives and friends and kill just as many geese as ever.

Managed Hunting Areas: Managed hunting areas on, or in close proximity to, major concentration areas have played an important role in accomplishing greater distribution of hunting opportunity and harvest. While there are many problems concerned with management of these areas and the benefits derived by the relatively small percentage of the hunters that are accommodated, these programs have received wide public acceptance.

## METHODS FOR OBTAINING CUMULATIVE KILL DATA

Under the harvest quota system, it has been necessary to implement procedures whereby the cumulative goose kill in the vicinity of major harvest areas can be determined at frequent intervals--in some cases, on a daily basis. In Illinois this is readily accomplished by requiring licensed club operators to submit kill records daily to State employees collecting such, or to mail report forms to a central point. Additional information, of course, is obtained on State-managed public shooting areas.

In Wisconsin, an intensive ground survey was started in 1960 and refined further in 1961 to determine the daily kill rate. This was accomplished by establishing a series of zones and sectors to systematically sample the intensity of hunting pressure and the actual kill within the total radius of influence of the flock. While this procedure requires considerable effort, it has been necessary to operate in this manner until a simplified and acceptable technique can be developed. Wisconsin Conservation Department personnel have been experimenting with a mail questionnaire covering the same general area that has given similar results. The chief problem with the mail questionnaire, however, is the time lag, prohibiting maintenance of daily cumulative kill records. We are also encountering problems in club operator and hunter cooperation under the voluntary reporting program since they know the kill reported will influence the length of the season. It is obvious that a different system will eventually be required to determine cumulative kill, such as compulsory reporting, some type of season limit with tag or registration requirement, or perhaps a satisfactory ratio of length of season to desired kill can be developed.

## THE HARVEST QUOTA SYSTEM

Excessive kills in southern Illinois during the mid-40's resulted in special attention to regulations to control the harvest of geese in this population (Davis 1954). The State of Illinois used many of the early findings of Hanson, Smith, and others, when they established maximum season kill on Canada geese in 1944 and 1945, followed by the closed season in the Mississippi Flyway in 1946. Following the closed season and subsequent recovery of the population during the period 1947-56, there did not appear to be a need for additional harvest restrictions. Subsequent increased harvest in the vicinity of the major concentration areas in Illinois and Wisconsin during the fall of 1957 again directed attention to the need for more closely regulating the kill. The subsequent decline in population levels in 1958 and 1959 led to enactment of more restrictive harvest regulations in Wisconsin and Illinois. Figure 2 shows the population trends and a greatly increased portion of the population harvested in Wisconsin during recent years. The high kill during 1957, together

with what was believed to be somewhat below normal reproduction resulted in a downward trend as shown by the 1958 midwinter survey data. During the 1958 hunting season, the kill again increased substantially in Wisconsin, and the season was closed early by the State in anticipation that a similar heavy kill might also occur in Illinois.

Before the 1959 season, the Bureau proposed at a meeting of the Mississippi Flyway Technical Section that the harvest quota system be tried for the Mississippi Valley population. Since this approach required close cooperation between Flyway States concerned and the Bureau, a Canada Goose Committee was appointed by the Mississippi Flyway Council to study the quota proposal and other aspects of Canada goose management.

In 1959 a proposal to establish a harvest quota of 60,000 birds from this population for all States concerned met with little success, since neither waterfowl technicians nor State administrators were able to agree on methods for attaining equitable distribution of the proposed harvest. The season in Wisconsin was again closed early when approximately 30,000 geese were harvested. Fortunately Illinois hunters killed fewer geese than in previous years, and the total kill during 1960 reached the approximately 60,000 figure suggested.

Following the midwinter survey in January 1960, a further population decline was evident. This development gave additional impetus to further consideration of the harvest quota system which was initiated for the Mississippi Flyway population of Canada geese during the fall of 1960. The Canada Goose Committee again, working through the Flyway Council, the principal States concerned, and the Fish and Wildlife Service, developed plans for limiting the harvest which were acceptable to all parties concerned. On the basis of breeding ground information, normal productivity rates, annual hunting mortality, and natural mortality rates, a harvest quota of 30,000 geese was established. Criteria reviewed applied principally to the three major concentration areas in southern Illinois and the two concentration areas in Wisconsin. Approximately one-third of the allowable harvest quota was set aside to compensate for kill in Michigan, Ohio, and Indiana, and to allow for crippling losses in all areas concerned. The remaining two-thirds of the quota were split between Illinois and Wisconsin on the basis of a 2 to 1 ratio as substantiated by previous kill data, peak populations, wintering populations, and distribution of band recoveries. The States concerned agreed to a split of 14,000 geese to be killed in Illinois and 7,000 in Wisconsin. The Mississippi Flyway Council proposed that the Fish and Wildlife Service incorporate the quota assignment for Illinois and Wisconsin in Federal regulations for the 1960 hunting season so that closure could be effected under Federal regulations if necessary. This was done with the understanding that the Fish and Wildlife Service would be concerned only with adherence to the

established quotas to each State and that Federal regulations would not attempt to incorporate any further divisions of these quotas within the states concerned.

As a result of a lag encountered in compiling cumulative kill data and legal procedures involved in effecting closure, the Wisconsin quota was exceeded by approximately 3,500 birds, with a total recorded kill of 10,500 occurring in  $9\frac{1}{2}$  days of hunting. In Illinois, the goose hunting was closed in the four counties concerned after 44 days of hunting when a kill slightly over the 14,000 quota was reached. When calculating the total loss from the population in the five major States concerned during 1960, it was estimated that approximately 38,000 geese were killed including crippling losses, somewhat greater than the 30,000 quota agreed upon, but considerably less than the 60,000 kill experienced in 1959.

Similar procedures were employed in 1961 to establish the harvest quota for the major States concerned. Since the midwinter survey in January 1961 showed an increased population level, a proportionate increase in the harvest quota was provided. Using the minimum reproduction levels and assuming that management should be directed toward maintaining an increased population trend following the 1961 hunting season, it was concluded that the stateside harvest, crippling loss, and natural mortality should not exceed 50,000 birds. A previous allowance was also made for Indian kill of approximately 9,000 geese annually along the west side of James Bay and Hudson Bay in Ontario (personal discussion with Harry Lumsden, Ontario Department of Lands and Forests, and Hanson, Illinois Natural History Survey).

In removing allowable percentages for natural mortality and crippling loss, it was agreed that the harvest in the Mississippi Flyway States concerned should not exceed 40,000 geese. Assuming that not more than 8,000 geese would be killed in Michigan, Ohio, and Indiana, it was agreed that approximately 32,000 geese could be taken in Illinois and Wisconsin. It was further agreed that this kill would be divided on the basis of 20,000 for Illinois and 12,000 for Wisconsin. Hunting of Canada geese in Dodge and Fond du Lac Counties surrounding the Horicon National Wildlife Refuge was closed after 18 days of hunting with a calculated actual kill of approximately 11,000 geese. The kill in the vicinity of the Necedah National Wildlife Refuge was about 800; thus, the 12,000 quota (actual kill, exclusive of crippling loss) for Wisconsin was not exceeded. The kill in the four counties concerned in Illinois was approximately 18,000. The harvest in the remaining States involved was somewhat below normal; therefore, the total harvest for this population during 1961 remained within the quota established.

The Canada goose harvest quota system as carried out during 1960 and 1961 is a major milestone in waterfowl management. This is a further refinement of species management as proposed in flyway management plans. It seems logical to continue this approach for those populations for which we have reasonably sound data on total population size and age composition, well-delineated breeding, migration, and wintering ranges, and procedures for obtaining reliable kill information. It is generally agreed by those involved that this approach must be continued until pre hunting season populations can be increased to where there is no danger of overharvest. The extent to which this can be accomplished is dependent upon the ability of breeding habitat to accommodate this expansion, adequate wintering areas to support increased population levels, and continuation of effective methods of controlling the harvest.

#### MODIFICATION OF THE QUOTA SYSTEM--EASTERN PRAIRIE POPULATION

Similar attempts have been made to regulate the kill of the Eastern Prairie population, particularly in the vicinity of the Swan Lake National Wildlife Refuge in Missouri. The chief handicap in this case is the present inability to determine the total population size, particularly at the time of the midwinter inventory, since various components of this population are scattered from southern South Dakota to Texas. These birds mingle with Canada geese from other populations on the Texas wintering grounds and in many cases, are found in widely scattered small flocks; thus, increasing the problem of even locating, much less associating, given groups of birds there with a specific population. Much remains to be done in analyzing band recovery data to determine distribution, hunting mortality, and the annual reproductive success. Progress is being made on all of these aspects. During the fall of 1961 a special effort was made to carry out coordinated censuses of this population throughout the major areas frequented in the Mississippi and Central Flyways to determine total population size. The results so far have been encouraging, but not conclusive.

In the meantime, the Fish and Wildlife Service and the Missouri Conservation Commission mutually determine the maximum allowable annual harvest based largely on present knowledge of distribution of this population during the first week of November when the peak population normally occurs in the vicinity of the Swan Lake Refuge, which is assumed to represent a large percentage of the birds in the entire population. In 1961, the allowable kill was based on a peak population of 75,000 geese. The Missouri Conservation Commission closed the designated zone surrounding the Swan Lake Refuge to goose hunting on November 25 after 25 days of hunting when the kill approached 15,000 birds as mutually agreed.

## FUTURE NEEDS

If we base future Canada goose management on the assumption that the breeding grounds offer unlimited potential for expansion of populations, that management programs in the United States should be directed towards maintaining increased population levels, and if we plan to apply the harvest quota system to other populations, it is imperative that the following action be taken:

1. Complete delineation of range and population size for the other major groups of Canada geese concerned, as has been done in the case of the Mississippi Valley population. In the latter case, it is believed that inventory methods used are sufficiently accurate for management purposes. This is not true for other major populations at this time.

2. Make a better determination of breeding ground capacities and factors influencing annual reproductive success. Further delineation and type mapping of potential breeding habitat, as currently being done in Ontario by Hanson and Lumsden, will aid in evaluating breeding ground capacities.

3. Additional attention should be given to refinements of techniques for obtaining an early index to breeding success prior to the establishment of annual hunting regulations.

4. Determine maximum size of goose populations that existing major wintering refuges and state management areas can support without experiencing severe food shortages and related depredations problems.

5. Determine how much additional migration and wintering habitat is needed to achieve better distribution of geese and harvest, and where such areas are most urgently needed.

6. Additional steps must be taken to learn how increased populations can be encouraged to use new areas. New approaches to experimental releases are desirable.

7. Intensify banding effort on the more southern wintering areas and other fringe flocks to better determine the relationship to specific harvest areas in the north.

8. Since the chief factor limiting further expansion of most Canada goose populations appears to be hunting mortality, refinements in determining annual harvest both stateside and in Canada are urgently needed.

9. Refinements in obtaining cumulative kill data in the vicinity of major harvest areas must be continued until such time it may be possible to achieve precise control of annual harvest through length of season; season bag limits, and registration procedures; or some other methods.

10. The Flyway Council committees should consider all possible criteria that can be used in establishing an equitable distribution of harvest quotas between States concerned.

11. Further consideration should be given to streamlining of legal procedures to expedite season closures when necessary.

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Table No. 1 - CANADA GOOSE POPULATIONS AND KILL DATA - 1955-62

<u>Mississippi Valley Populations</u>								
	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>
Midwinter Survey Population:								
Illinois*	173,534	190,943	227,825	149,815	204,123	111,209	162,887	158,684
Indiana	4,065	7,612	1,869	12,917	1,173	9,203	3,180	784
Ohio	2,647	1,954	2,089	2,470	748	1,566	1,476	1,568
Michigan	18,275	10,580	8,650	7,947	5,068	8,958	6,601	6,728
Wisconsin	<u>5,564</u>	<u>5,527</u>	<u>2,605</u>	<u>4,176</u>	<u>4,065</u>	<u>5,509</u>	<u>20,248</u>	<u>4,316</u>
Total:	204,085	216,616	243,038	177,325	215,177	136,445	194,392	172,080

\*Includes all Illinois areas and southeast Missouri. Ballard County, Kentucky data included for 1956, 1957, 1958, 1960-62. (Estimate only for 1956-57; 35,000 present in 1958; 8,000 in 1959 but not included in midwinter survey data above; 7,280 in 1960; 2,500 in 1961; and 6,100 in 1962.)

**Kill:\*\***

Wisconsin	7,500	9,000	11,000	19,400	29,600	14,000	14,100
Illinois***	24,400	41,000	62,500	45,500	24,700	18,200	23,000
Indiana	800	1,000	1,000	1,200	600	1,200	1,000
Michigan****	2,500	2,500	3,000	2,800	3,100	3,600	2,400
Ohio	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>1,700</u>	<u>1,800</u>	<u>2,300</u>
Total:	35,200	53,500	77,500	68,900	59,700	38,800	42,800

\*\*Includes 20% crippling loss. (Actual crippling loss in Illinois may not run this high.) Reflects kill in vicinity of major concentration areas, not state-wide.

\*\*\*Includes Crab Orchard, Horseshoe Lake, Union County, Illinois; southeastern Missouri, and Ballard County, Kentucky.

\*\*\*\*Upper peninsula and southwestern Michigan.

Table No. 2 - Peak Fall Populations of Canada Geese and Hunter Kill  
Swan Lake National Wildlife Refuge and Vicinity

<u>Year</u>	<u>Population</u>	<u>Estimated Total Kill*</u>
1938	150	-
1941	800	-
1943	4,000	-
1944	4,500	-
1945	10,000	-
1946	4,000	200
1947	11,000	500
1948	18,000	1,000
1949	34,000	5,800
1950	32,000	2,000
1951	45,000	3,400
1952	50,000	6,000
1953	84,000	4,000
1954	104,000	8,600
1955	133,500	21,000
1956	56,000	6,700
1957	42,000	9,900
1958	60,000	21,500
1959	58,000	11,600
1960	84,000	18,500
1961	75,000	15,000

\*Includes estimated 20% crippling loss.

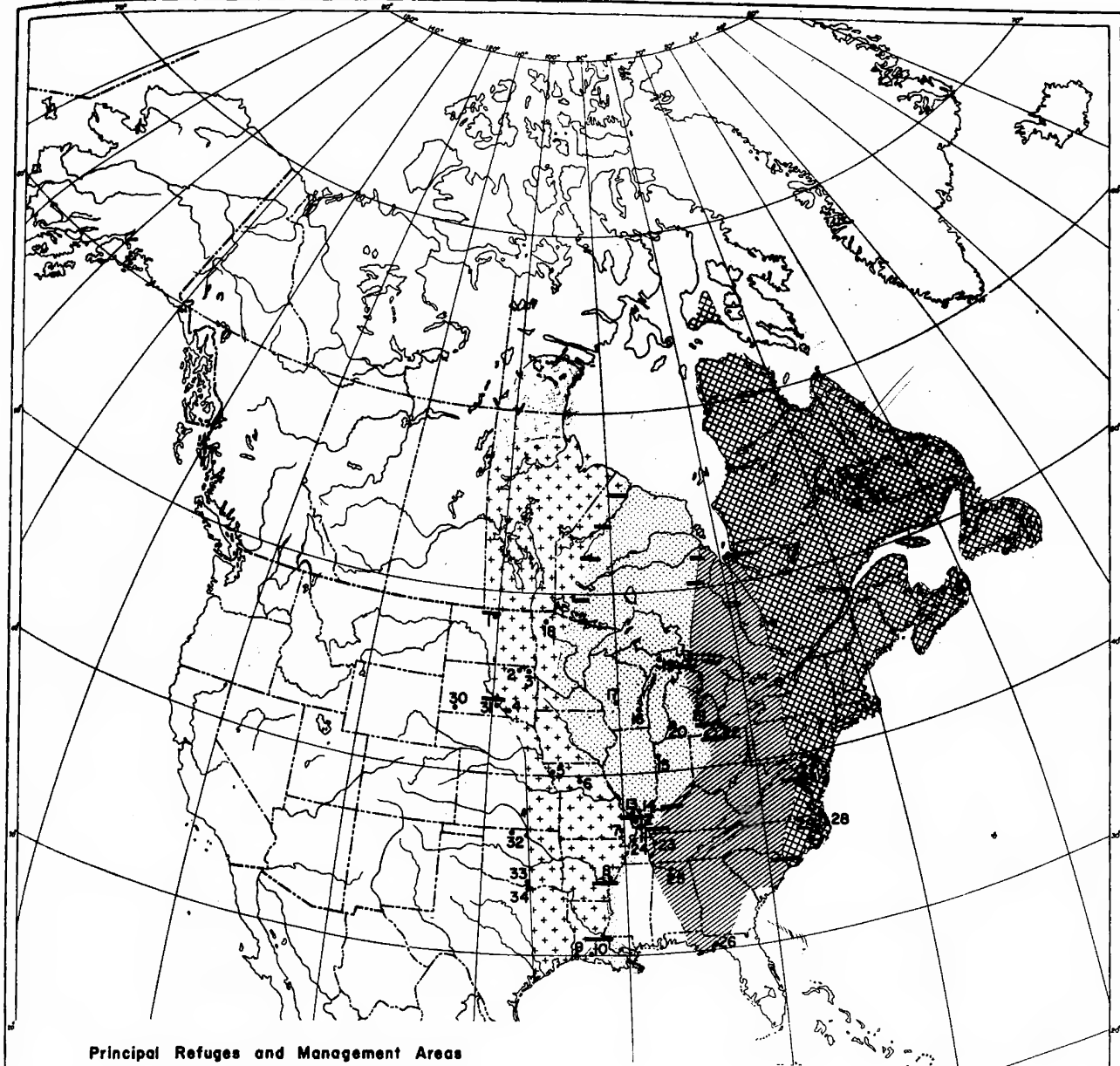
Table No. 3 - Peak Populations of Canada Geese on  
the Missouri River, South Dakota

<u>Period*</u>	<u>Peak Population</u>	<u>Wintering Population</u>
1953-54	47,800	-
1954-55	36,000	4,000
1955-56	45,000	5,700
1956-57	24,000	14,400
1957-58	28,000	28,000
1958-59	34,000	22,000
1959-60	29,000	15,500
1960-61	37,000	14,600

\*October 15-February 15. Peak populations generally occur  
November 10-December 10.

Table No. 4 - Peak Fall Goose Populations and Kill in the Vicinity of  
the Sand Lake National Wildlife Refuge, South Dakota

<u>Year</u>	<u>All Geese</u>	<u>Small Canada Geese</u>	<u>Percent Small Canadas</u>	<u>Kill All Geese</u>	<u>Kill Small Canadas</u>	<u>Percent Small Canadas</u>
1949	62,000	43,000	70	15,000	11,500	77
1950	61,000	40,500	67	12,200	8,600	75
1951	78,000	19,000	25	8,600	3,100	36
1952	22,500	17,000	76	1,700	1,400	85
1953	27,000	15,500	60	4,900	3,200	66
1954	50,000	9,500	19	5,800	2,200	38
1955	24,000	13,000	54	2,300	1,800	82
1956	101,000	14,000	14	3,600	900	29
1957	40,000	8,000	21	2,300	1,600	69
1958	48,500	5,000	11	2,200	1,000	46
1959	43,000	18,000	42	9,300	6,000	65
1960	36,000	22,000	61	9,600	8,500	89
1961	115,400	25,000	22	8,300	3,200	38



Principal Refuges and Management Areas  
used by Canada Geese

1 Lower Souris (F)	18 Mud Lake (F)
2 Sand Lake (F)	19 Seney (F)
3 Waubay (F)	20 Fennville - Swan Creek (S)
4 Lake Andes (F & S)	21 Shiawassee (F & S)
5 Squow Creek (F)	22 Jack Miner (P)
6 Swan Lake (F)	23 Tennessee (F)
7 Mingo (F)	24 Reelfoot (F)
8 White River (F)	25 Wheeler (F)
9 Sabine (F)	26 St. Marks (F)
10 Lacassine (F)	27 Blackwater (F)
11 Bollard County (S)	28 Pea Island (F)
12 Horseshoe Lake (S)	29 Mattamuskeet (F)
13 Union County (S)	30 Lacreek (F)
14 Crab Orchard (F)	31 Chamberlain (S)
15 Willow Slough (S)	32 Salt Plains (F)
16 Horicon (F & S)	33 Tishomingo (F)
17 Necedah (F)	34 Hagerman (F)

(F) - Federal, (S) - State, (P) - Private

FIGURE 1

## RANGES OF CANADA GOOSE POPULATIONS

ALANTIC MISS. VALLEY  
SOUTHEAST EASTERN PRAIRIE

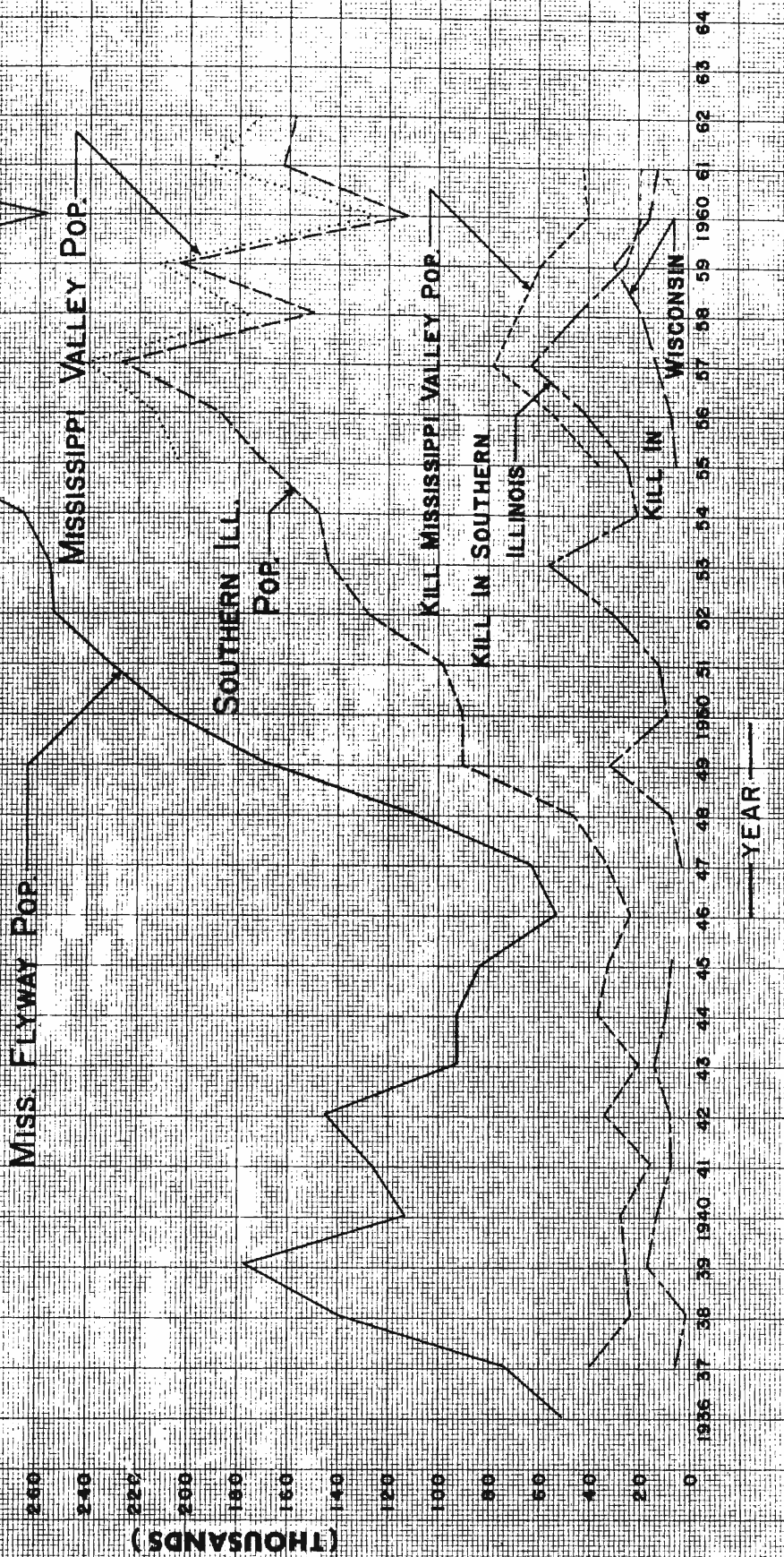
OVERLAP

UNITED STATES FISH AND WILDLIFE SERVICE

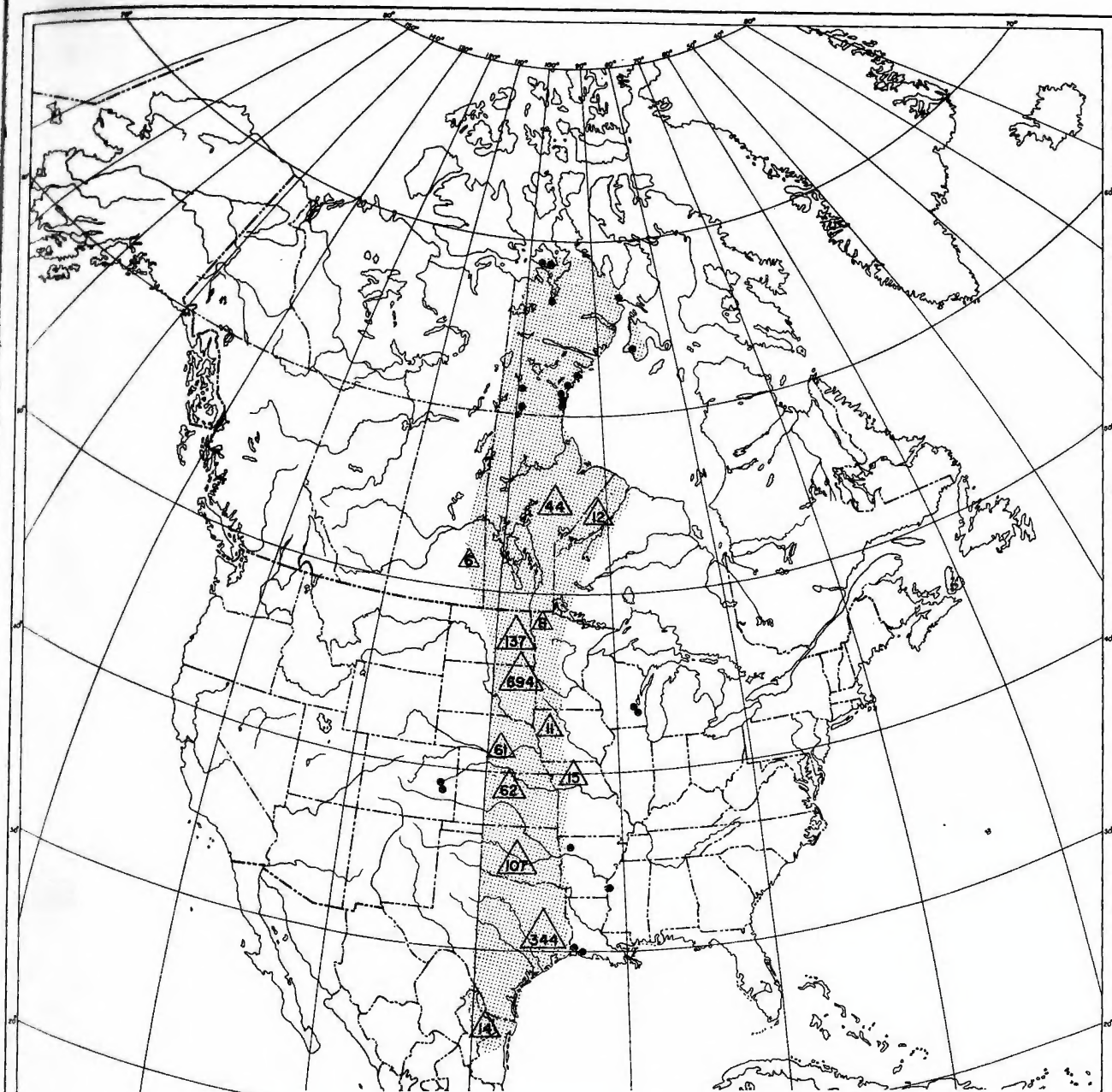
BUREAU OF SPORT FISHERIES AND WILDLIFE

100 0 100 300 500  
Statute miles

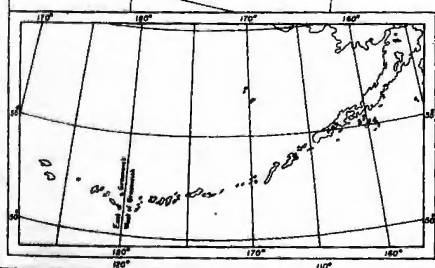
**FIG. 2 - CANADA GOOSE POPULATIONS**  
(JANUARY - MID-WINTER SURVEY)



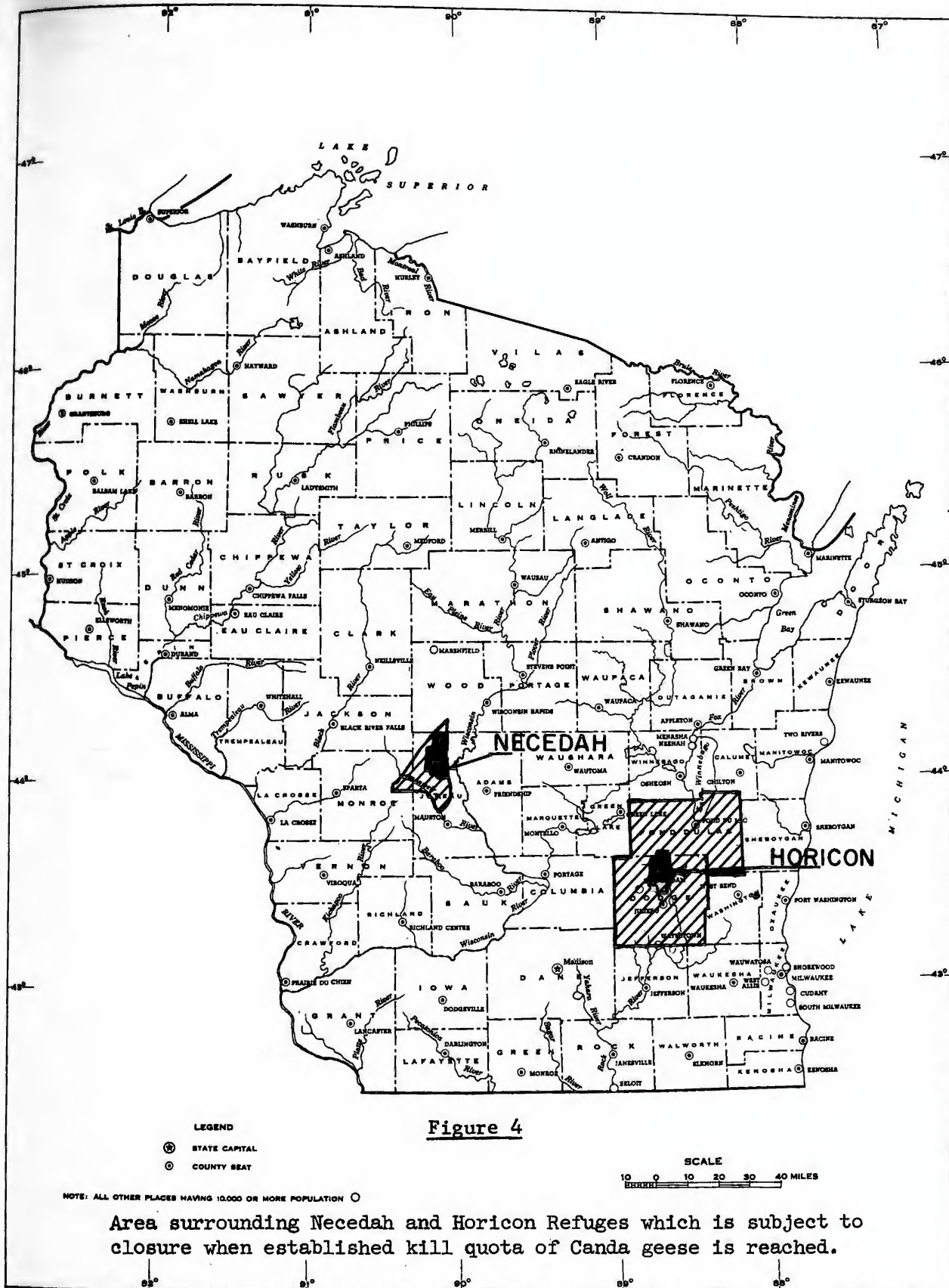




**FIG.3- SMALL CANADA GEESE BANDED  
AT SAND LAKE REFUGE, S. D.  
1951-1960**



● = INDIVIDUAL RETURNS  
 ▲ = STATE TOTAL RETURNS  
 TOTAL NO. RETURNS = 1,539  
 TOTAL GEESE BANDED = 7,358  
 % RETURNS = 21



WISCONSIN

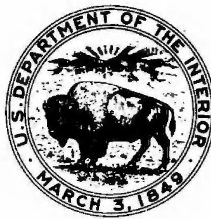


**Figure 5 - Four-county Area in Southern Illinois Subject to Closure When Established Kill Quota of Canada Geese is Reached**



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